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Old Coulsden
Surrey

dp 2.3.99

Patents ADP number *(if you know it)* 7602493001

If the applicant is a corporate body, give the country/state of its incorporation

4. Title of the invention — TRANSACTION MANAGEMENT SYSTEM

5. Name of your agent *(if you have one)*

LLOYD WISE, TREGEAR & CO

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

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LONDON WC1A 1LW

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TRANSACTION MANAGEMENT SYSTEM

The present invention relates to a system for management and control of transactions, especially retail transactions.

In a normal retail environment, such as a supermarket, there are a number of individual sales points, each of which include a till. These tills may have a Electronic Point Of Sale (EPOS) system by which the tills are connected on a network to a central unit. Details of transactions, including the items sold, the value of the items sold and the type of payment, for example cash, credit or debit card, cheque or coupon are transmitted to the central unit. Information relating to the products sold may be used to control the ordering of further stock. Details of the type of payment and value of the transactions are used to balance the tills at the end of trading.

Each day, a float is provided at each till. During trading, cash payments, cheques, coupons and card payment slips are added to the till, and change is given from the cash in the till. There is a security risk in having a large amount of money in the till as the till is vulnerable to attack. It is normal therefore for some notes to be removed periodically from the till and the shop floor. Typically, an unknown amount of money is removed from the till for this purpose. This may be achieved either by a store supervisor visiting the till and removing money from the till and taking this to the cash office, by the till operator placing the money in a secure cash box provided at the till site from where the money can be removed by a supervisor, or by placing the money in a canister which is then transported off the shop floor, for example through air tubes.

At the end of the trading day, the money remaining in each till, together with the money taken from the till during the day, is collected and counted. This money is then compared with the amount of money that is calculated from the EPOS records to have been received. Similarly, each of the cheques, credit and debit card slips and coupons are collected, added together and compared with the amount and value of the associated transactions from the EPOS system.

The till floats are then replenished for the following days trading. The money, cheques, credit and debit card slips and coupons are collected and bagged as required for the bank or other institution where the money is to be received, before being sent to the bank or other institution to be credited to the store's account.

It will be appreciated that, especially for large stores with a large number of tills and a high turnover, the counting and balancing of payments received with the EPOS totals is a very time consuming operation. For a store having five till points, the time spent in counting and balancing the cash transactions alone can be in excess of 20 hours per week.

In an attempt to reduce the amount of time spent counting and balancing payments after the close of the store for the day, it is usual that, where money is removed from the till throughout the day, this cash is counted after removal. Nevertheless, this does not reduce the overall amount of time that is required to count the money.

Also, it is not uncommon for the counting and balancing of the transactions to be deferred until the following day. This is especially the case where stores are open until late in the evening, in which case it is cheaper to pay staff to balance the tills during normal hours the following day than late in the evening when pay rates are

higher. In this case, the money is not counted until the day following that when it is received, the money is often then dispatched to the bank the following day, where the money is counted before being credited to the store's account. Therefore, the length of time in processing the money means that the money is not credited to the store's account until some days after the money has been received.

A problem with the conventional system remains security. It is unsafe to leave large amounts of money on the shop floor as this is an easy target for a thief. Nevertheless, the removal of money from the tills and transportation of this across the shop floor is also a potential security risk as the money is especially vulnerable during this time. Also, the large amount of money in the till where it is easily accessible to the till operator means that there is the risk of money being removed by the till operator. As the money in the till is not balanced until the end of the day's trading, it is often impossible to determine when money went missing, and it is therefore impossible to determine who took the money. The only way to avoid this problem is to carry out a complete balancing of the till every time a new operator begins work, but this is often impractical given customer demands for tills to be opened during busy periods. A further security risk occurs within the store's cash room where all the money is collected, counted and balanced. Again here it is possible for staff to take money, and it cannot be determined where or when the money was taken and by whom.

A further problem facing all retail outlets is that of forgery, since it is normal merely to carry out a visual inspection of cash received to determine its authenticity. With increasing sophisticated forging, this is not sufficiently reliable.

Similar problems apply with other transaction types, for example cheque and credit and debit card payments. In this case, the time consuming process of counting the number and value of the transactions and collecting these together to send to the bank is still incurred. There is also a similar security risk, although to a lesser extent than with cash as the cheques and card payment slips are made in favour of the store and so cannot be used easily by an unscrupulous member of staff.

According to the present invention, a transaction management system comprises a station at a sale point and a control unit, the station comprising:

a means for entering transaction information, including the value of the transaction and the method of payment;

a secure unit for receiving and identifying payments received, and storing the payments received in a tamper evident package in an identifiable manner including the type and value of the payments; and

a means for communicating the transaction information and identification of the payments stored in the tamper evident package to the control unit.

With the system of the present invention, when a transaction is complete, the till operator is able to input to the system the type of payment, for example a cash payment. When the payment is received, this may be identified to the system, and then stored in a secure, tamper evident package. The payment tendered is transmitted to the control unit. As the payments received are provided in a tamper evident package, are identified and their identity is transmitted to the control unit, it is possible to reduce the amount of counting and balancing required at the end of trading, since the amount and type of payment received and contained in the tamper evident

package can be determined merely from the amount calculated by the control unit.

It is preferred that the system includes a station at each of a plurality of sales points, the stations being connected to a single control unit. In this way, the processing for a number of points of sale can be carried out by the same control unit. In this case, each individual station is preferably connected to the control unit over a network.

It is advantageous that the control unit records not only the nature and value of the transaction, but also the time of the transaction. In this case, if there is a discrepancy, it will be easier to identify when that discrepancy occurred. Further, it is preferred that each till operator is required to log on when they are to carry out transactions at a station, and in this way the operator responsible for a discrepancy may be identified easily. In this case, if an operator is not working in accordance with a normal procedure, this can be identified and appropriate training given.

The system may be arranged so that payments of a particular type are stored in the secure unit and other payment types are stored and processed in a conventional manner. Alternatively, a number of different types of payment may be stored and handled in one or more secure units.

In one example of the present invention, the secure unit may be provided for handling cash payments, in particular note payments. In this case, the secure unit may include a means for determining the value of the note. The means, or a further means, may determine the authenticity of the note. The note, once its value and/or authenticity have been determined, may then be passed to the tamper evident package. In this case, if the operator indicates that a

payment is to be made by cash, and the note handling means such as a validator does not receive a note, this absence of a note may be passed to the control unit to identify an error, either a breach in procedure, for example the operator indicating the wrong type of transaction or putting the money directly in the till, both of which can be corrected by appropriate training, or a breach of security, for example the operator taking the money. Since the time of the breach may be identified to the system, the operator responsible for the breach can be identified.

When the note handler receives a note and determines that the note is unacceptable, for example if this is a forgery, the note is preferably rejected. In this case, the system is able to identify forged notes that are tendered, and therefore can potentially reduce significantly or eliminate the store's loss due to forged notes.

The secure unit may alternatively or additionally be provided for receipt of other identifiable forms of payment. For example, it is common for stores to have a printer for printing cheques and credit and debit card slips. In this case, the secure unit may be provided with an optical character recognition system that identifies the value printed on the cheque or slip before the cheque or slip is passed into the tamper evident package. More preferably, an identification mark may be printed additionally on each cheque or slip printed by the system, for example in the form of a bar code. This additional information may include the value of the transaction, the number of the transaction and the customer's details, including for example their name and bank sort code. This information may be read by a suitable decoder, for example a bar code reader, provided in the secure unit.

In an embodiment of the present invention, non-cash payments may be handled in a conventional manner, for

example by the operator placing these in a till drawer. The system may include a handling unit in the cash room, the handling unit having a means to identify parameters of the payment, and the tamper evident package. In this case, the non-cash payments from a number of stations can be collected and fed into the handling unit where each payment is identified and stored in the tamper evident package in an identifiable manner.

At the or each sales point within, there may be provided a single secure unit for receiving payments of a single type, for example cash payments, a number of different secure units for transactions of different types, for example one secure unit for cash, one for cheques and one for credit and debit card vouchers, or one or more secure units which are able to handle a number of different types of payment.

In a preferred example of the tamper evident package is a bag or other container provided within the secure unit. In the case where the unit is able to handle payments of different types, all of these different types of payment may be received in a single bag or container, or may be stored in separate bags or containers. This depends on the requirements for payment sorting, for example by the bank in which the payments are to be deposited. By providing the payments in a store such as a bag or container within the unit, the payments can be removed from the unit as a single item, rather than being removed individually. This is advantageous as it increases the ease and speed with which the payments can be removed, and ensures that all payments are removed from the unit, without leaving any behind.

It is preferred that the tamper evident package is sealed before it can be removed from the secure unit. By sealing the store before it is removed from the secure unit, it is extremely unlikely that access can be obtained to the store

without this access being evident. This ensures that the amount of payments contained in the store corresponds to the amount determined by the system to have been entered into the tamper evident package. If there has been any attempt to remove items from the store, this will be visible and tamper evident and the contents can be checked.

It is preferred that the tamper evident package is made of a plastics material, such as polythene. In this case, the bag or container forming the store can be sealed by a heat seal unit, an infra-red seal unit, chemical sealing unit, by pressure sensitive adhesive or by vacuum sealing.

It is preferred that the seal includes some form of unique identification, for example a unique identification code embedded in or printed on the seal. In this way, it will be difficult for the seal to be broken and the store re-sealed without this being evident as it will be difficult to replicate the unique identification.

A lock is advantageously provided on the secure unit, for example an electronic lock, which is only released after the tamper evident package has been sealed. In this way, access to the store is prevented until the store has been sealed.

It is preferred that the tamper evident package includes individual identification, for example in the form of a bar code. Such identification may be embedded into the store. In this way, the contents of the tamper evident package can be determined from the identity of the store and the log of payments provided to the control unit. The identification may be stored in a chip or other memory device. In this case, the memory device may also record details of the content of the store, for example the details sent to the control unit. In this way, if there is a breakdown in the

system, for example if the control unit fails, there will be a record of the contents of the store.

The secure unit may include a fluid powered, preferably gas powered, delivery system to transport the notes, cheques, slips, or coupons from the identifier or validator to the tamper evident package. This delivery system is preferably in the form of a channel that is provided adjacent the outlet of the identifier or validator, and which includes an array of fluid flow openings provided on its upper and lower face. The channel is provided within a duct into which air or other fluid is driven, preferably by fans or blowers, to create a region of high fluid pressure surrounding the channel. The openings in the channel are angled with respect to the longitudinal plane passing through the channel and to the plane normal to the channel. Accordingly, the air or other fluid from the high pressure region around the channel is jetted into the channel to give a generally vertical component of fluid extending upwardly from the lower face and downwardly from the upper face, and jets passing longitudinally through the channel. In this way, a note or other piece of paper or the like passing through the validator or identifier will be received within the channel and will be suspended between the upper and lower faces of the channel by the generally vertical component of the fluid entering the channel through the openings. The note will be entrained by the component of fluid passing though the channel to pull the note from the validator or identifier, through the channel and into the tamper evident package. It has been found that the fluid delivery system is much better than a physical delivery system relying on transportation of the note or voucher by endless belts or rollers as it conveys the item more reliably.

The openings may be in the form of an array of holes, much like a cheese grater. The fluid will jet through these

holes to convey the note. Alternatively, the openings may be in the form of elongate slots extending substantially across the width of the channel. The advantage of slots is that the area through which the fluid enters the channel is larger, giving a greater volume of fluid to convey articles through the channel. Nevertheless, the resulting velocity of the fluid flow will be lower compared to that where holes are used.

Where a fluid delivery system, and in particular an air delivery system, is used to deliver the notes to a bag or container forming the tamper evident package, the bag or container must include a fluid outlet through which the fluid entering the bag or container is discharged. It is preferred that the fluid outlet is in the form of holes provided in the wall of the bag or container, although, where the fluid is gas, they may be in the form of a gas permeable membrane. Where holes are provided in the bag or container, these should be of a size such that items contained within the bag or container cannot be removed through the holes.

It is preferred that the fluid outlet provided within the bag or container is provided at the upper part of the bag or container remote from the inlet. It has been found that in this way, when the fluid enters the bag or container, turbulence is created within the package which forces the entrained note, voucher or the like downwards within the bag or container, and compresses items already in the bag or container towards the bottom of the bag or container. If the outlet is provided at other locations within the bag or container, it has been found that this effect is reduced. If the outlet is provided too low within the bag or container, the outlet is liable to become blocked as items are introduced into the bag or container.

The provision of fluid outlets and their location apply for other forms of tamper evident package.

At each sales point, there is advantageously provided a display, for example a liquid crystal display unit, on which details of the verification or identification of the payment may be displayed. This is particularly advantageous as any dispute over the amount tendered can be resolved by viewing the details of the verification. For example, if a customer pays with a note of one denomination, and then suggests that he paid with a note of larger denomination and therefore requires more change, the value of the note which was determined by the validator can be seen on the display to resolve the argument. The display may also be arranged to show instructions for the operator, and show the reason for any rejection of a note or other type of payment. It is preferred that a number of details are displayed on the display, for example by scrolling these, giving a history. A printer may also be provided to print a hard copy of all displayed messages.

The system may also allow communication between a till operator and the control unit. For example, if an operator requires additional change, often in the form of coinage, the operator is able to transmit a message to the control unit that such change is required, and this change can be delivered to the operator. This is much quicker than the operator calling a supervisor, advising the supervisor of their requirement, and the supervisor obtaining the required change.

The system may be controlled to maintain the level of the float at the or each point of sale. During some transactions, it will be necessary for money to be removed from the till and given to the customer, for example in the form of change for a cash transaction, and where a customer requires cash from their credit or debit card account.

Accordingly, the level of cash in the till will reduce so the till operator may be unable to give the change required. By determination of the amount of cash removed from the till, for example as change, based on the EPOS details and the payments received, the system is able to determine the current level of cash in the till. When the level of cash falls below a predetermined level in comparison to the initial float, money may be returned to the till to make up the deficit. For example, if a till has an initial float of £250, cash will be removed from this during trading and returned to customers. The system may determine when the level of cash has fallen to £200. In this case, when further cash is received as a payment and is inserted in the secure unit, the secure unit, after checking the value and/or authenticity of the note or notes as required is controlled to return these to the till operator or directly to the till rather than passing these to the tamper evident package, and the till operator may then add these to the till, thereby maintaining the float at a generally constant level. Especially towards the end of trading, the allowable difference between the actual and the original float level may be reduced, so that the end of trading float corresponds closely to the start of day float. This means that will be minimal differences to make up before the next trading session starts. By automatically topping up the till float in this way, the average level of the till float can be reduced, since it is not necessary to have a large initial float to allow for removals. This reduces the security risk. Where the system includes a display unit, the instruction to return money to the till can be displayed on the system.

The system may also be used to control the dispensing of coinage as change at each sale point. In this case, a coin dispense system including an array of coins of different denominations may be provided at each sale point. When a cash transaction is indicated, the amount tendered is

either entered manually by the till operator or is determined by a validator, and the change required is calculated as the difference between the two. The system is then able to compute how the change may be given from the coinage contained in the coin dispenser, and the appropriate coins are dispensed in any known manner. The coin dispenser may also be used to collect, verify and/or sort coins received in payment. In this case, all coins received as payment may be put into a coin sorter and/or verifier which determines the value of the coins received, calculates any change required in the normal manner, and sorts the coins by denomination and stores these in the array for future use as change.

The control unit collates details of all transactions, including for example the number and time of the transaction, the value of the transaction, the method of payment and the details of the location of the payment, for example in the till or in the or each tamper evident package. From this, the system is able to determine the total value and type of payment in any tamper evident package. Therefore, it is possible for the store containing payments to be removed, and the total value and nature of the payments contained to be known automatically by the system without the need for the payments to be counted. The payments contained in the tamper evident package can then be deposited directly with the bank, and their contents identified with reference to the identity of the tamper evident package without the need to balance or count the payments. This provides a substantial decrease in the amount of time required to process the payments, and a substantial increase in security since the payments are always contained in a secure, tamper evident package and there is minimal handling of cash by members of staff. It is also possible for the information relating to the content of the individual packages to be downloaded to the bank or other destination immediately. It is therefore

possible for the system, overnight, to inform the bank of the identity of the packages to be sent to the bank, and the content of each package, without the need for any counting or balancing following the end of trading. The packages may then the sent to the bank. The packages may be identified as leaving the retailer by use of their identification, for example as they are loaded onto a security van, can be identified as they are received at the bank and compared to the list sent to the bank from the system. The bank may then confirm that the content of the packages corresponds to the content which they have been advised, although it is expected that in due course the banks will consider this unnecessary and will rely on the advised content of the packages from the retailer. In this way, the payments can be credited to the retailer's account much more quickly than is presently the case.

An example of the present invention will be described in accordance with the accompanying drawings, in which:

Figure 1 shows a schematic view of a system according to the present invention;

Figure 2 shows a schematic view of a secure unit used in the present invention;

Figure 3a shows a detailed view of an air channel;

Figure 3b shows a cross-section view through a fluid inlet;

Figure 4 shows an alternative air channel;

Figure 5 shows a bag sensor and fixing means;

Figure 6 shows an air supply system;

Figure 7 shows a bag;

Figure 8 shows an alternative bag; and,

Figure 9 shows a coin sorting and change giving system.

A basic embodiment of the present invention is shown in Figure 1. In a conventional manner, the retail outlet includes a number of Electronic Point Of Sale tills 1, one

of which is shown, that are linked by a network to a central control unit. Each EPOS till includes conventional components, such as a till drawer 2 for storing coinage received and some notes for change, cheques, coupons and card payment slips, a bar code reader for reading details of the products sold from which the value of the products is determined and details of the products sent to a stock management system for ordering new products, and a cheque printer. The system also includes an input for the till operator to indicate the type and value of payment received, for example to indicate a cash, cheque or card payment. Where necessary, the system calculates the change due as the difference between the payment tendered and the overall value of the transaction. Change may then given to the customer from the till drawer 2.

Additionally, the till has a note handling system 3 which is linked by an interface to the EPOS system, and to a central control. As described in more detail below, the note handling system 3 comprises a secure unit into which notes tendered by a customer are inserted for validation and storage in a tamper evident package.

In use, when the till operator indicates that a cash payment is to be made, the operator enters the amount tendered, from which the change to be given is calculated in the usual manner. In this case, any coins tendered are placed in the till drawer 2, and any change required taken from the float in the till drawer 2. Any notes received are fed into a validator 5 of the cash handling system 3 as shown best in Figure 2.

The note handling unit 3 is formed as a lockable metal, typically steel case. The front 15 of the case includes a chassis on which the components of the note handling unit 3 are mounted. The front 15 is provided on arms (not shown) including rollers to allow the front 15 and the

chassis to be removed easily to allow access to the interior of the case. The construction of the case is such that it is secure, so that any attempt to breach the case is resisted due to the strength of the case, and any attempt to breach the case is easily apparent. The unit also includes an alarm to alert any attempted, unauthorized opening. The alarm may include an audio alarm in the unit and/or a remote alarm, for example a signal may be sent to give a visual alert at the control unity. The case is locked by an electronic lock 14 which allows the case to be opened only after predetermined procedures have been completed as described below. The case includes an inlet slot 16 through which notes are inserted, and a note validator 5 which receives and validates the notes. The case includes a void which receives a plastics bag 7 or other package for the notes. Notes from the validator 5 are deposited in the package. When the unit is opened, the bag 7 and its contents are removable from the unit.

The authenticity and denomination of each note is determined by the validator 5. The validator 5 may be a conventional validator 5 such as the IDS validator available from Global Payment Technologies, Inc. A note is inserted into the validator 5, and is driven, typically by a series of endless belt conveyors and/or rollers, past one or more note recognition devices. The validator determines parameters of the note, for example its size, colour and magnetic properties. These determined parameters are compared with predetermined acceptable ranges of parameters for notes of different denominations. Based on this comparison, the note is either rejected if it cannot be determined to be a genuine note, or accepted and its value determined. Where a note is rejected, the belts or rollers are driven in reverse to eject the note. The result of the determination of the validator is sent to the interface 4 or other control circuitry for appropriate processing or transmission to the central control unit of the system.

All accepted notes that pass through the validator 5 extend into an air channel 8 of an air chute 6. As best shown in Figure 3a, the air channel 8 comprises a generally oval channel 8 having a width of about 90mm, a height of about 20mm and a length of about 95mm. The upper and lower faces 31,32 of the air channel 8 include an array of openings 30 which are spaced in rows extending across the width of the channel 8 in which adjacent openings 30 are spaced by 20mm, with adjacent rows being spaced by 10mm with a 10mm offset between openings 30 in adjacent rows. As shown in cross-section in Figure 3b, each opening 30 is formed by providing a 5mm hole through a dimple formed in the surface 31,32 of the channel 8, the hole being formed at an angle of about 45° to the channel 8. The resulting openings 30 are similar to those of a cheese grater. The air channel 8 is formed of metal sheet, such as aluminium, into which the holes 30 are punched or drilled and the dimples pressed using a punch and die. Alternatively, the air channel 8 may be moulded, for example from a plastics material. The dimple may be formed either into the channel 8 or out of the channel 8. In the case where the dimple is formed into the channel 8, the dimple is formed behind the hole 30 in the direction in which the note is to pass from the validator 5. In the case where the dimple is formed out of the channel 8, the dimple is formed in front of the hole 30 in the direction in which the note is to pass from the validator 5. As shown in Figure 3b, the dimple causes air from outside the channel 8 to flow into the channel as a laminar air flow having a major component in the direction through the channel 8.

An alternative air channel 8' is shown in Figure 4. In this case, the openings comprise elongate slots 30' provided in the upper and lower faces 31'32' of the air channel 8'. A guide 33, which may be pressed out of the channel 8' to form the elongate slots 30', directs air into

the channel 8' as a laminar flow generally as described above. In the following, it will be understood that either air channel 8 or 8' may be used.

As shown in Figure 6, the channel 8 is provided within a duct 9, 45, both ends of which open to a fan or blower 10, for example a RL90-18/12NG DC radial blower available from PAPST which provides a flow rate of $40m^3h^{-1}$. The duct 9 extending from each of the blowers 10 has a width of about 25mm and a depth of about 70mm giving a cross-sectional area of about $1750mm^2$. The ducts 9 from the blowers 10 are linked by a further duct 45 having a height of around 70mm and a depth of around 70mm. The air channel 8 is provided within this duct 45. The blowers 10 blow air into the ducts 9, 45, increasing the air pressure around the channel 8. The high pressure air, typically of around 2 atmospheres, passes through the openings 30 of the channel 8 into the channel 8. Due to the angle at which the openings 30 are formed, and the dimple, the turbulent air in the duct around the channel 8 is directed as a laminar flow into the channel 8 in the direction generally away from the validator 5. As the openings 30 are formed in both the upper and lower faces 31,32 of the channel 8, there will be a component of air passing vertically upwardly and downwardly to the centre of the channel 8. This acts to maintain the note hovering near the middle of the channel 8 so the note can pass freely through the channel 8 without catching on the surfaces of the channel 8. Typically, 10 to 20% of the air flows vertically. The horizontal component of the air, the remaining 80 to 90%, acts to entrain the note and draws this from the validator 5 into the bag 7.

Sensors (not shown) are provided towards the end of the air channel 8 remote from the validator 5 for sensing the presence of a note within the air channel 8. The sensor may also detect the direction of movement of a note within

the air channel 8. The purpose for this sensor is described below. On the outer surface of the air channel 8 at the end remote from the validator 5, there are provided two projections 41,42, the projection 42 nearest the end of the channel 8 remote from the validator 5 having an inclined surface. A sensor element 43 is provided between the two projections 41,42. This is shown in Figure 5. The projections 41,42 and sensor 43 are provided for location of a bag 7 on the air channel 8 and for ensuring the bag 7 is mounted correctly as described below.

As shown in Figure 7, the collection bag 7 comprises a generally cuboid bag 7 formed of polythene or other plastics material. The bag 7 has a width of about 120mm, a length of about 250mm and a height of about 300mm. Such a bag 7 has a capacity of about 500 to 700 bank notes. An opening slit is provided across the upper front edge of the bag 7, and a neck 62 having a length of about 50mm is provided from this opening. An array of holes 61 is provided on the top face of the bag 7 towards the back, and on the rear of the bag 7 towards the top. Typically, around 100 holes 61 are provided on each of the upper and rear faces of the bag 7, each hole having a diameter of about 2mm. The bag 7 is designed so that, once inflated, it assumes its generally cuboid shape, although can be flat packed for storage. The secure case also includes air vent holes through which air can enter the case to be driven by the blowers 10, and from which air leaves the case after leaving the bag 7. The bag 7 includes a plastics rim 64 around the neck 62 of the bag 7 for fitting the bag 7 to an air channel 8 as described below. In an alternative arrangement, an internal removable ring may be provided to be secured to a bag 7 and fitted to the air channel 8.

An alternative bag design is shown in Figure 8. This bag is a cylindrical bag, again the an upper slit type opening

with an associated neck 62' and air holes 61' provided in the upper rear of the bag 7.

Notes entrained in the air flow through the air channel 8 are transported by the air stream through the neck 62 of the bag 7 and into the bag 7. As the air flow enters the large volume in the bag 7, turbulence is introduced into the laminar air flow. This turbulence causes the entrained notes to be forced towards the bottom of the bag 7. The turbulent air flow also acts to compress the notes already deposited in the bag 7 to maximise the number of notes which the bag 7 may contain. The air then leaves the bag 7 through the holes 61 in the top and rear of the bag 7. It is important that the velocity of the air flow into the bag 7 is not too great, since this will cause a reduction in the pressure in the top part of the bag 7, and this will cause the notes in the bag 7 to lift.

The bag 7 includes a unique identification mark such as a bar code that is embedded in the plastics material from which it is formed. An identical bar code is embedded in a tear off strip 65 that is provided on the bag 7. This strip may be removed from the bag 7 as this is fitted and used for identification.

In use, the bag 7 is provided within the secure case by placing the bag 7 within the void in the rear section of the case, and mounting the open neck 62 of the bag 7 over the end of the air channel 8 remote from the validator 5. The neck 62 of the bag 7 is provided over the channel 8 to create an air tight seal. As shown in Figure 4, the end of the air channel 8 remote from the validator 5 includes a pair of spaced projections 41,42. The projection 42 near the end of the channel 8 includes an inclined surface. In between the projections there is provided a sensor 43. As described above, the neck 62 of the bag 7 is provided with a solid member 64 which is slid over the inclined surface

of the projection 42 nearest the end of the channel 8, and locates between the two projections 41,42. In this position, the presence of the solid member 64 is detected by the sensor 43 and it is determined that the bag 7 is correctly loaded. A switch is then actuated, causing the fans or blowers 10 to be activated and air to flow into the air channel 8 and into the bag 7. This air inflates the bag 7, causing the bag 7 to assume its cuboid arrangement. The dimensions of the bag 7 are slightly greater than the space within the case of the secure unit in which the bag 7 is provided, thereby ensuring that the bag 7 assumes the shape of the space in the case. Where the bag 7 is not formed with a solid ring 64, but is mounted using a separate member, this can also be detected by a suitable sensor.

When the bag 7 is loaded, the identity of the bag 7 is recorded in the central unit so the payments deposited in the bag 7 may be identified. To achieve this, a bar code reader associated with the money handling unit reads the bar code embedded in the bag 7, or the bar code on the tear-off strip. In one example, a hand-held bar code reader is provided at the station, and the information is read form the embedded bar code by the reader and this information is transmitted to the central unit for logging. In another example, the validator 5 doubles as a bar code reader. In this case, the tear-off strip from the bag 7 is read through the validator 5 which reads the bar code to identify the bag 7 and this information is transmitted to the central unit. In a still further example, the bag identification may be manually input to the central unit. In any case, it is arranged that the validator 5 will not accept notes until the bag 7 has been identified to the control unit.

In an alternative arrangement, a small memory chip or processor is attached to the bag 7. The memory chip

includes a unique identification. The memory chip can be read to identify the bag 7. The memory chip can also be written to, and so can store a copy of the information sent to the control unit as described below. In this way, the bag 7 itself has a store of its contents.

As shown in Figure 2, a heat seal unit is provided to seal the open neck 62 of the bag 7 downstream of the air channel 8. The heat seal unit is a conventional unit, comprising two bars 11,12 which are movable with respect to each other to clamp the neck 62 of the bag 7. Both of the bars 11,12 are coated with a non-stick material, for example Teflon (Trade Mark) to ensure that the molten plastics material of the bag 7 does not adhere to the bars 11,12. One of the bars 12 includes a heating element which is heated by a current to melt the plastics material and weld the two sides of the neck 62 of the bag 7 together.

One of the bars 11 is pivotally mounted to allow this to be moved out of the way when a bag 7 is to be mounted on the air channel 8. One of the bars 12 is actuated by a motor 13 to drive the bars 11,12 with respect to each other to clamp the neck 62 of the bag 7. This bar 12 is moved between a rest position about 50mm from the neck 62 of the bag 7 and a seal position by the motor 13. A microswitch (not shown) is provided to detect when the bars 11,12 are clamping the neck 62 of the bag 7, and this causes a current to be applied to the heater element for a predetermined period, typically 3 seconds, to weld the neck 62 of the bag 7 closed.

The heat sealing unit embeds a unique identification in the seal. This is achieved, for example, by the profile of the sealing bars. As it is difficult to replicate the unique identification, it is difficult for the seal to be broken and a new seal formed without this being apparent.

The secure case is locked by an electronic lock 14, including a solenoid or other magnetic element. When the key is actuated to unlock the case, before the lock is released, the heat seal unit is actuated to seal the bag 7. Only then is the case opened to allow access to the bag 7. In this way, the bag 7 is sealed to form a tamper evident package before it can be accessed, giving a high degree of security.

Under certain circumstances, in particular where there is a note in the neck 62 of the bag 7 in the region where the bag 7 is to be sealed, it is desirable not to heat seal the bag 7. In this case, the electronic lock 14 will not allow the case to open. In this case, it is necessary for the case to be opened by an over-ride lock which is actuatable only be a person with a high security level, for example a bank employee or a senior supervisor. The over-ride lock may be in the form of a magnetic touch key, for example a Dallas DS19xx Touch Key Memory. Such a device provides an over-ride lock that is within the casing, and which is not visible externally. Accordingly, there is no external indication of its presence and location. The lock is opened by a high security, unique passive key which interacts with the specific lock to over-ride the normal electronic lock 14 to give access to the secure unit and the unsealed bag 7 contained therein.

As previously described, the end of the air channel 8 remote from the validator 5 includes a sensor to detect the presence and direction of movement on a note within the air channel 8. The sensor may comprise a number of proximity sensors, for example a number of light emitter and detector pairs, arranged in the direction of travel of the note through the air channel 8. The presence of a note can be determined when any of the light detectors does not receive light from its associated light emitter due to a note blocking the light path between them. The direction of

movement of a note can be determined by the order in which the light is blocked or not blocked for the different sensors. For example, where the light is blocked first between the emitter-detector pair nearest the validator 5 and then between the pair nearest the end of the air channel 8 remote from the validator 5, it can be determined that the note is moving from the validator 5 towards the bag 7. When the light is initially blocked between all pairs, and then light is received first by the detector nearest the end of the air channel 8 remote from the validator 5 and then by the detector nearest the validator 5, it is determined that the note is moving in the direction away from the bag 7 and towards the validator 5. This may occur when a note is rejected by the validator 5, or when there is an attempt to remove notes from the secure unit.

The provision of a proximity sensor in the air channel 8 allows the system to confirm that there are no notes in the neck 62 of the bag 7 when the case is unlocked to prevent the bag 7 sealer from sealing the neck 62 of the bag 7, and sealing the note in place. The proximity sensor can also confirm that the notes leaving the validator 5 are received within the bag 7, and can confirm that no notes are jammed within the air channel 8. The system ideally records the receipt of a note within the bag 7 only when it is determined by the sensor that the note has passed through the air channel 8 and into the bag 7, rather than when the note is determined by the validator 5. The reason for this is that it is possible for a note to pass through the validator 5 and remain in the air channel 8. When a subsequent note is inserted into the validator 5, the note may be rejected for a number of reasons. However, the leading edge of the note may contact the note stuck within the air channel 8, and when the note is rejected, this may pull the jammed note from the air channel 8. Therefore, if the content of the bag 7 is determined purely on the output

from the validator 5, it will be determined by the system that the note jammed in the air channel 8 and rejected with a following note is in the bag 7, where as, in fact, the note will not be in the bag 7. By only determining that the note has entered the bag 7 after the note has been determined to have left the air channel 8, the notes in the bag 7 are determined correctly.

A note may be rejected by the validator 5 if the parameters of the note do not fall within the predetermined parameters of an acceptable note. This rejection is a function of the validator 5.

An interface 4 is associated with the cash handling system 3 for transmitting information to a central control, for example the identification of the bag 7, the number of notes and their denomination in the bag 7 and the time at which the notes are deposited in the bag 7.

In this way, the central control receives and can record a list associated with each identifiable tamper evident package of the contents of that store, broken down for example by the quantity of notes of different denomination. Therefore, when the store or package is sealed and removed from the unit, the list of contents is associated with the package allowing the package to be treated as a single item of known composition and value. Therefore, there is no need for the package to be opened and the contents counted and balanced. This reduces significantly the amount of time spent in handling the notes and, by reducing the handling, increases the level of security.

The interface 4 also receives information from the EPOS system. For example, when the till operator indicates that a payment is to be made by cash, and the amount exceeds a predetermined level corresponding to the smallest denomination of note of a currency, an indication can be

sent to the interface 4 to alert the cash handling system 3 that a note can be expected. In the event that no note is received and validated, the interface 4 can alert the central controller. There are a number of reasons why a note may not have been received - the customer may have tendered only coins, there may be a breach in procedure, for example the till operator may have put the money directly in the till or may have entered the payment type as cash in error, or there may be a breach of security, for example the money may not have been received by the till operator, or the operator has taken the money. In any case, the time at which this inconsistency occurred will be identified, and steps can be taken to rectify this, for example by training. This is assisted if the till operator is required to log on when they start operating a till. This sign on can be communicated either over the normal EPOS system or via the interface 4 to the central control, and therefore the operator responsible for the inconsistency can be identified.

The central control unit is also able to control aspects of the operation of the cash handling system 3, for example to cause notes to be returned to top up the till drawer 2 rather than being deposited in the tamper evident package 7.

The system knows how much cash is added and removed from the till since it knows the value of each transaction, the amount of money received and the change due from the EPOS system. The system knows therefore how much money is in the till at any one time. The system is therefore able to determine when the float in the till falls more than a predetermined level below the required float. In this case, the system is able to determine that notes fed into the validator 5 will not be deposited in the bag 7, but will be returned to the till operator for topping up the

till. This is indicated to the central control to ensure that the list of items in the tamper evident package 7 corresponds to that actually deposited, and does not include items which are returned to the till.

The system also includes a scrolling liquid crystal display screen which gives messages to the till operator. For example, the display screen can indicate the denomination of a note determined by the validator 5. Therefore, if a customer presents a note of one denomination and later claims to have tendered a note of a different denomination, the actual denomination of the note determined by the validator 5 will be displayed to resolve the matter. If a note does not fall within the allowable parameters for notes of acceptable types, a reject message can be displayed so the till operator knows that the note is not acceptable and that different payment is required. Similarly, if the note is to be returned to the operator to top up the till float, an instruction message may be presented on the display. The system messages may also be printed on a dedicated local printer so there is a hard copy of all messages produced by the system.

In a preferred example of the invention, the system allows communication from the till point to the control unit. A keypad is provided at the point of sale to allow the till operator to request change. In this case, when the till operator requires additional coinage for change, the operator merely keys in the request which is transmitted to the control unit which can indicate the request. The change is then provided to the till, for example by being manually taken to the till point.

In a further example of the present invention, instead of the operator manually entering the amount of cash tendered, the value of the notes tendered may be determined by the note validator 5, and a similar validation system may be

used for the coinage, thereby determining automatically the amount tendered and the change due.

The system may also be provided to automatically dispense the change required. As shown in Figure 8, the coins tendered are placed in a hopper 80, and the authenticity and denomination of each coin is determined in a known manner by a suitable coin sorter 81 such as the Coin Counters Model 1321 or 1361 available from Cummins Alison Ltd. From this, the value of the coins tendered is determined. The coins are then sorted by denomination and pass though an outlet 82 of the sorter 81 into separate hoppers or stacks 83 for coins of different denominations. The coins are held in the hoppers or stacks 83 by gates 84. The system determines the change as the difference between the amount tendered and the value of the transaction, and determines how to provide the change from the coinage available in a known manner. The appropriate coinage is then discharged from the hoppers 83 by opening the appropriate gates 84 to discharge the coins along a discharge chute 85 to provide the change. The system may also be arranged to discharge notes from a note float, or may instruct the till operator to manually supply certain notes from the till float.

Although the main benefit of the system is gained from the cash handling system 3, since cash is the easiest form of payment to be stolen and the hardest to identify, count and balance, similar secure units as that described for notes may be used for other forms of payment, for example for cheques and credit cards. In this case, the note validator 5 is replaced by another form of identification means which is able to determine features of the payment.

When a payment is to be made by cheque, the till operator indicates this to the EPOS system. In many stores, a cheque printer is provided as part of the EPOS system to

print details on customers' cheques, for example the retailer's account name, the amount of the transaction and the date. In addition, the system of the present invention is able to print a bar code or other readable identification on the reverse of the cheque, including encoded information relating to the transaction number and amount, and other information such as the customer's details, bank sort code etc. After the customer has signed the cheque, this is fed into the secure unit for cheques. The reader provided within the secure unit reads the bar code printed on the back of the cheque to obtain the information contained within the bar code to identify the cheque, the value and the transaction to which the cheque relates. The cheque is then deposited in a bag or container 7 through an air channel 8 in the same way as notes as described above. Alternatively the cheque may be transported by rollers or endless belt conveyors. The information relating to the deposited cheque is transmitted over the network to the central unit. When the secure case is opened, the bag 7 is sealed in the manner described with respect to the cash secure box. Therefore, as with the cash transactions, at the end of trading a tamper evident sealed bag 7 is produced containing the cheques received, and the full details of the cheques contained in the bag 7 are held in the central unit and the list can be associated with the respective package. Therefore, there is no need to count and balance the cheques with the records from the EPOS system, and the package can be sent to the bank in the same way as the cash packages.

A similar system can be used for credit and debit card payments.

Alternatively, a separate unit may be provided for cheques in a cash room or other central location. In this case, cheques are processed in the usual manner by the sales assistant, and collected in the till drawer. The cheques

are later removed from the till drawer. The cheques are then fed into a secure unit which identifies the cheques, for example using an optical character reader or a bar code reader to read a specially printed bar code on the cheque. The cheque is then fed to a tamper evident package as described above, which is sealed before it can be removed. In this way, a tamper evident package containing identified cheques is produced. It will be appreciated that this arrangement can be used for other forms of payment such as credit and debit card payments and coupons. It will also be appreciated that this system may be used alone, namely without the individual tamper evident packages provided at each sale point associated with a transaction entry system.

It will be appreciated that the cash, cheque and card payment secure units can be formed as a single unit. In this case, the note validator 5 may also function as a bar code reader, as is the case with the Global Payment Technologies, Inc. IDS validator 5. The payments received may then all be deposited in a single bag 7, or may be sorted automatically by type and deposited in one of a number of bags 7 provided in the unit, for example one each for cash, cheques and card vouchers. Alternatively, there may be a number of inlets to the secure unit, each inlet having an appropriate identifier or validator 5. For example, the unit may have a cash inlet for notes with an associated note validator 5, a cheque inlet with an associated bar code reader for reading a bar code printed on the rear of the cheque, and a card voucher inlet with an associated optical character reader for reading the details of the transaction from the voucher, all with associated air channels 8, bags 7 and heat seal units.

With the system of the present invention, many payments made by customers are identified and validated as they are deposited in a secure case. The payments can only be removed from the case in an identifiable, tamper evident

package. The identity of the items deposited in the secure, tamper evident package, including their value, are known and stored in a central control, together with an identification of the unit in which the items are stored. When the secure cases are opened, the payments contained within the units are sealed in a tamper evident, identifiable package. The content of the package can be determined from the list of contents. Any attempt to violate the package, for example to change the contents, will be apparent. Therefore, the content can reliably be considered to correspond to the list of contents unless there is a visible indication that an attempt has been made to violate the package. Therefore, the package can be handled as a single unit of known value. This reduces significantly the amount of time required to balance the tills at the end of trading, since it is no longer necessary to count individually all of the payments received and compare this to the expected totals from the EPOS system. Further, details of the contents of the packages may be sent to the bank or other payment processor immediately at the end of trading. The packages are identifiable, and therefore it can be confirmed that the particular packages leave the store, for example that they are loaded onto a security van for transportation to the bank. It can also be confirmed that the particular packages are received by the bank. The bank are therefore able to confirm the receipt and content of the packages quickly, and therefore are able to credit the store's account quickly.

Where money is carried to and from a security van, it is usual for these to be carried in a secure box that includes a dye or smoke system which is activated if the box is stolen, for example where the box is moved more than a predetermined distance from the security van. The holes in the bags 7 also allow the dye or smoke to pass through the bag 7 and cover the contents as an anti-theft measure.

It will be appreciated that many of the controls and determinations which are referred to above as being made by the control unit may be made locally at the point of sale and vice versa.

CLAIMS

1. A transaction management system comprises a station at a sale point and a control unit, the station comprising:

a means for entering transaction information, including the value of the transaction and the method of payment;

a secure unit for receiving and identifying payments received, and storing the payments received in a tamper evident package in an identifiable manner including the type and value of the payments; and

a means for communicating the transaction information and identification of the payments stored in the tamper evident package to the control unit.

2. A transaction management system according to claim 1, comprising a station at each of a plurality of sale points that are connected to a single control unit.

3. A transaction management system according to claim 2, in which each of the individual stations is connected to the control unit over a network.

4. A transaction management system according to any one of the preceding claims, in which the control unit records the time of the transaction.

5. A transaction management system according to any one of the preceding claims, in which each till operator is required to log in when they are to carry out transactions at a station.

6. A transaction management system according to any one of the preceding claims, in which the secure unit is provided for handling cash payments, and includes a note validator for receiving a note and determining the authenticity and value of the note.

7. A transaction management system according to any one of the preceding claims, in which, where it is indicated that a payment is to be made by cash, and the validator does not receive a note to validate, this absence of a note is transmitted to the control unit.

8. A transaction management system according to any one of the preceding claims, in which the secure unit is provided with a recognition or identification system that identifies the value printed on the cheque, card slip, coupon or voucher before the cheque, card slip, coupon or voucher is passed into the secure unit.

9. A transaction management system according to claim 8, in which the system includes a printer for printing an identification mark on each cheque, credit or debit card slip, coupon or voucher tendered as payment and the recognition or identification system reads the identification mark printed on the cheque or voucher to identify the cheque or voucher.

10. A transaction management system according to any one of the preceding claims, in which each station is provided with a number of different secure units for transactions of different types.

11. A transaction management system according to any one of claims 1 to 9, in which each station has one or more secure units which are able to handle a number of different types of payment.

12. A transaction management system according to any one of the preceding claims, in which the tamper evident package is a bag or other container.

13. A transaction management system according to any one of the preceding claims, in which the tamper evident package is sealed before it can be removed from the unit.

14. A transaction management system according to claim 13, in which the bag or container is security sealed before it can be removed from the secure unit.

15. A transaction management system according to any one of the preceding claims, in which the tamper evident package includes individual identification.

16. A transaction management system according to claim 15, in which the individual identification is in the form of a memory chip attached to the tamper evident package.

17. A transaction management system according to any one of the preceding claims, in which the payment is transported from into the tamper evident package by a gas powered delivery system.

18. A transaction management system according to claim 17, in which the delivery system comprises a channel provided adjacent the outlet of the identifier or validator, and which includes an array of angled fluid flow openings provided on its upper and lower face, the exterior of the channel being pressurised with gas which jets through the angled openings into the channel to give a generally vertical stream of fluid extending upwardly from the lower face and downwardly from the upper face, and jets passing longitudinally through the channel to entrain the payment.

19. A transaction management system according to claim 18, in which the openings are in the form of louvred slots extending substantially across the width of the channel.

20. A transaction management system according to any one of the preceding claims, in which a display, for example a liquid crystal display unit, is provided at each sale point on which details of the verification or identification may be displayed.

21. A transaction management system according to any one of the preceding claims, in which a means is provided for communication between the or each station and the control unit.

22. A transaction management system according to any one of the preceding claims, in which the system is controlled to maintain the level of the float at the or each station.

23. A transaction management system according to claim 22, in which the money remaining in the till is determined from the value of the cash transactions and the payments received, and when the determined level of cash in the till falls below a predetermined level in comparison to the initial float, money is returned to the till to make up the deficit.

24. A transaction management system according to any one of the preceding claims, in which each sale point includes a coinage dispense system for dispensing change.

25. A transaction management system according to any one of the preceding claims, in which the control unit collates details of all transactions, including for example the number and time of the transaction, the value of the transaction, the method of payment and the details of the location of the payment, for example in the till or in an identifiable secure area to determine the total value and type of payment in any secure area from any point of sale.

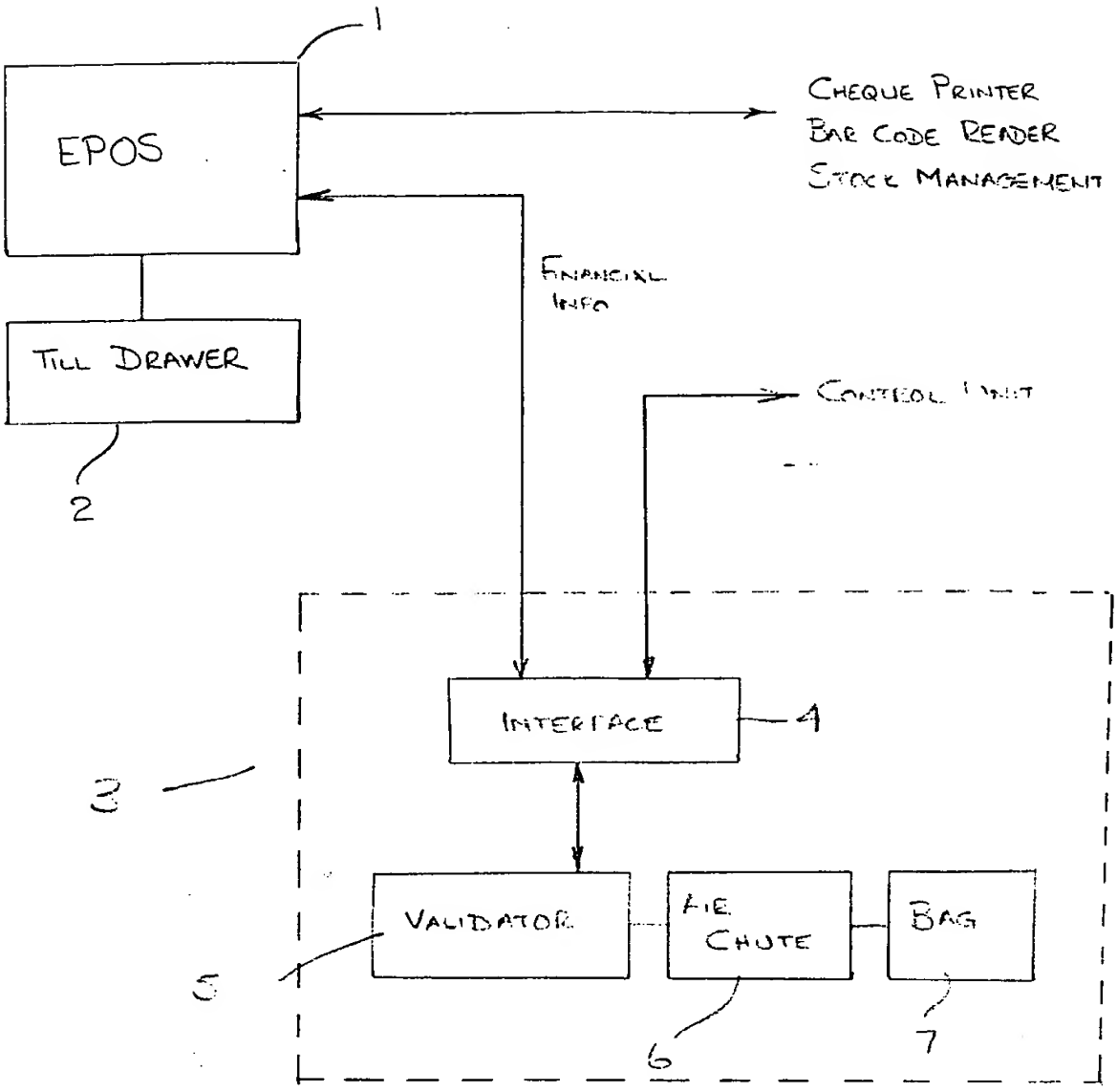
1
EPOS
CHEQUE PRINTER
BAR CODE READER
STOCK MANAGEMENT
FINANCIAL INFO
TILL DRAWER
CONTROL UNIT
2
INTERFACE
4
3
VALIDATOR
A.E. CHUTE
BAG
5
6
7

Figure 1

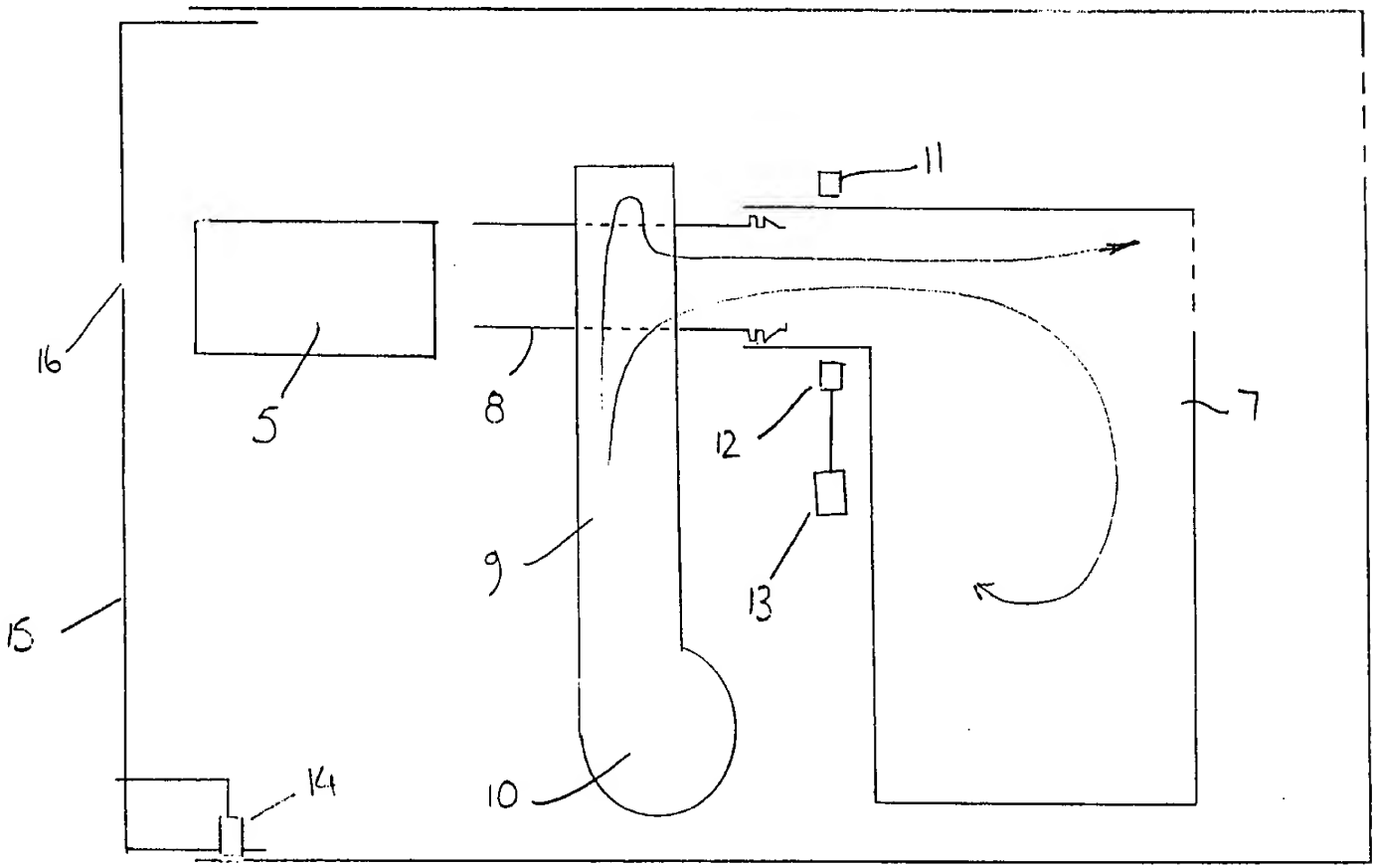

Figure 2

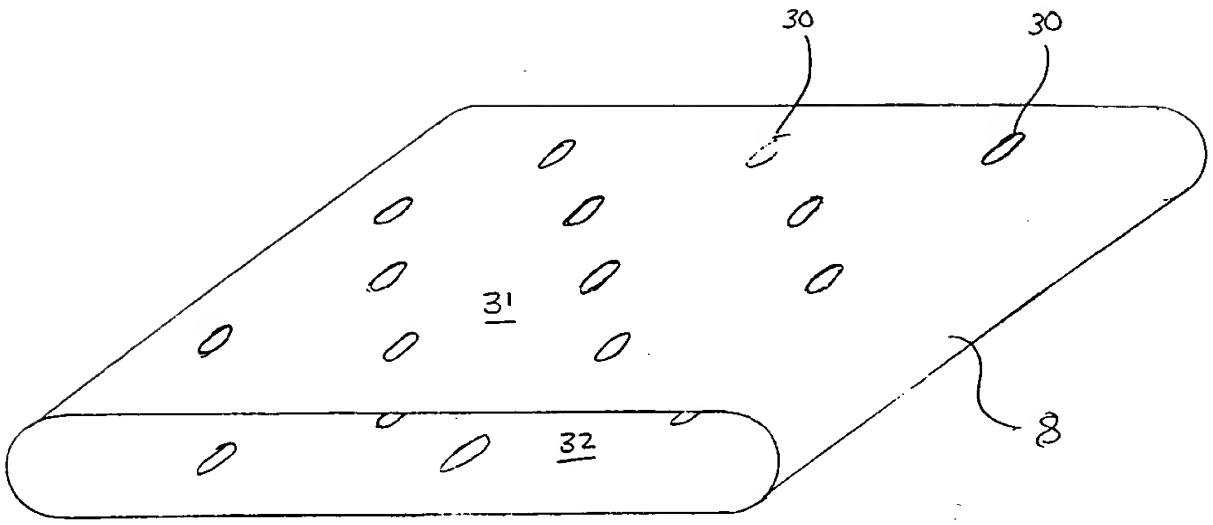

Fig 3a

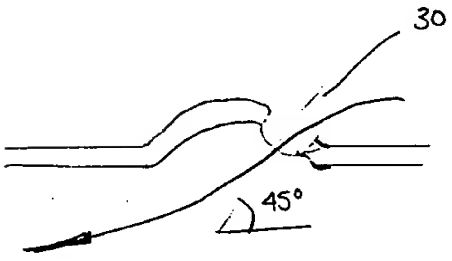

Fig 3b

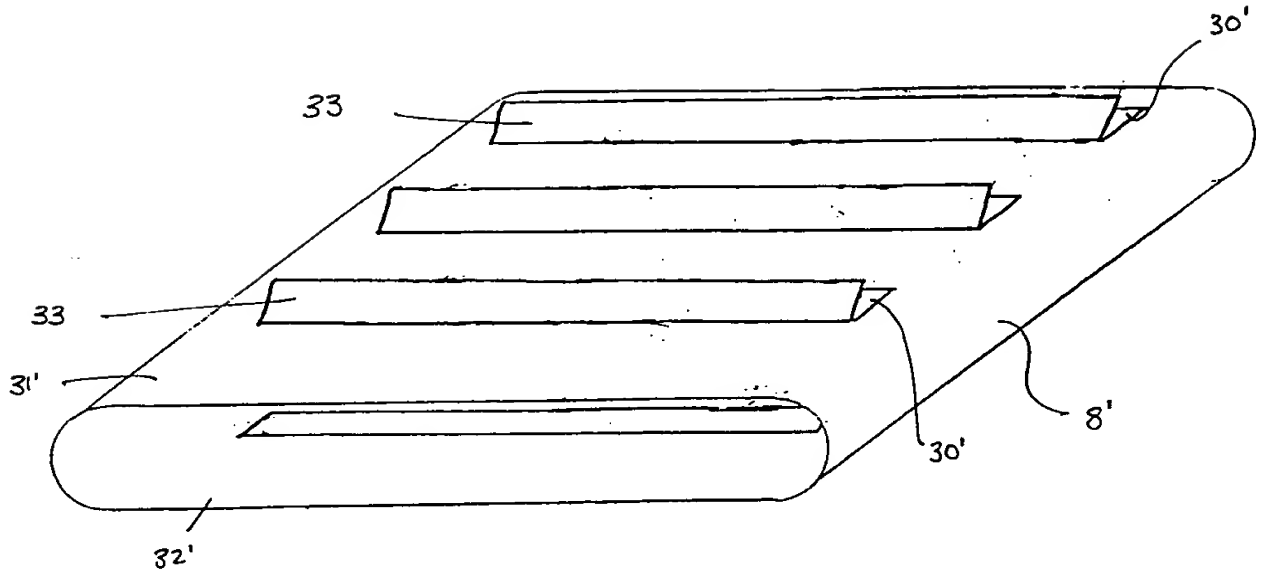

Fig 4

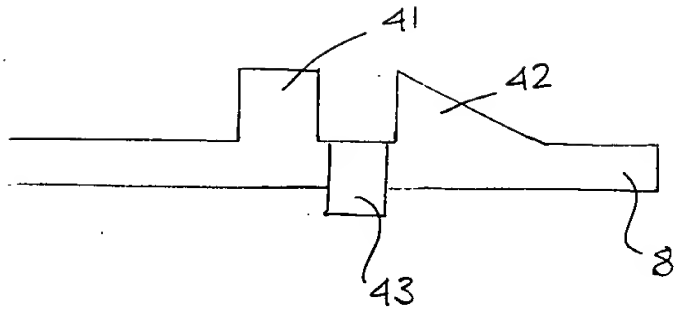

Figure 5

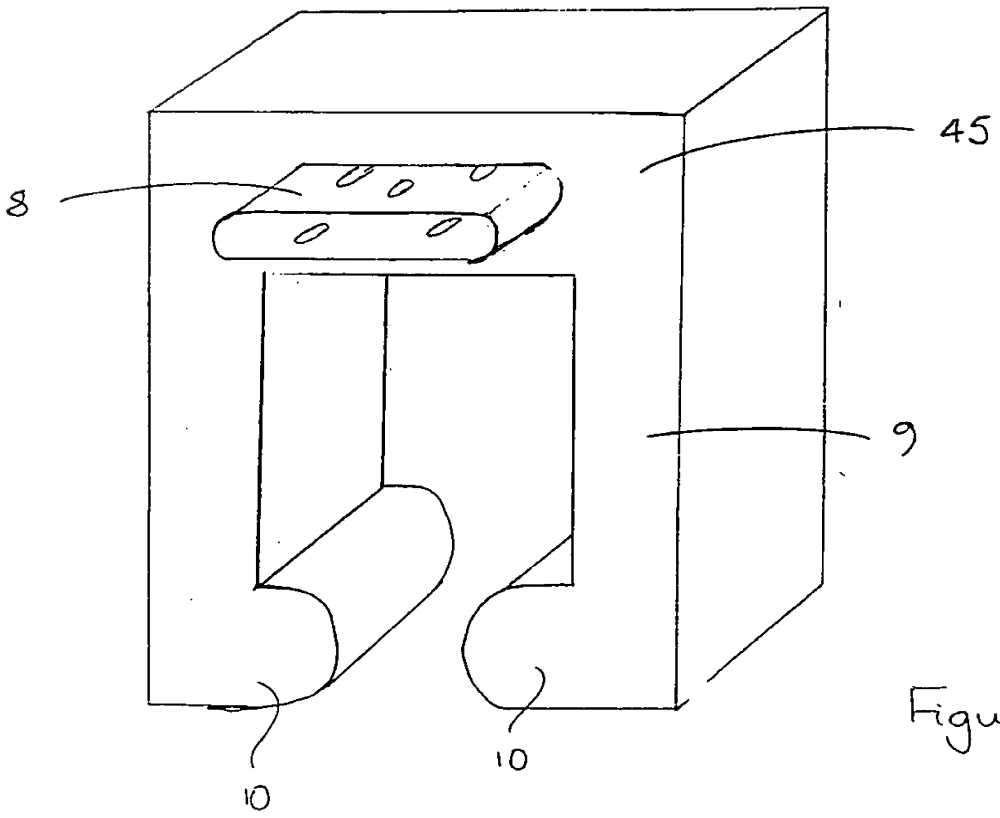

Figure 6

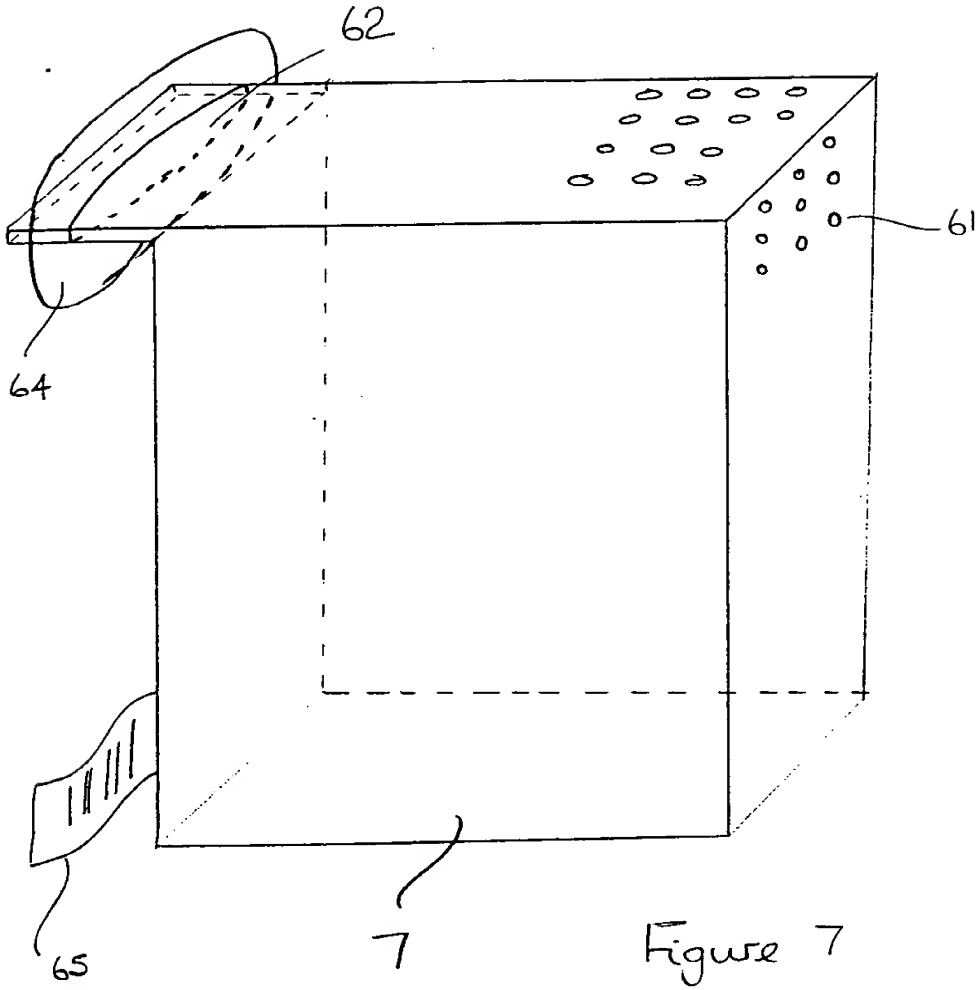

Figure 7

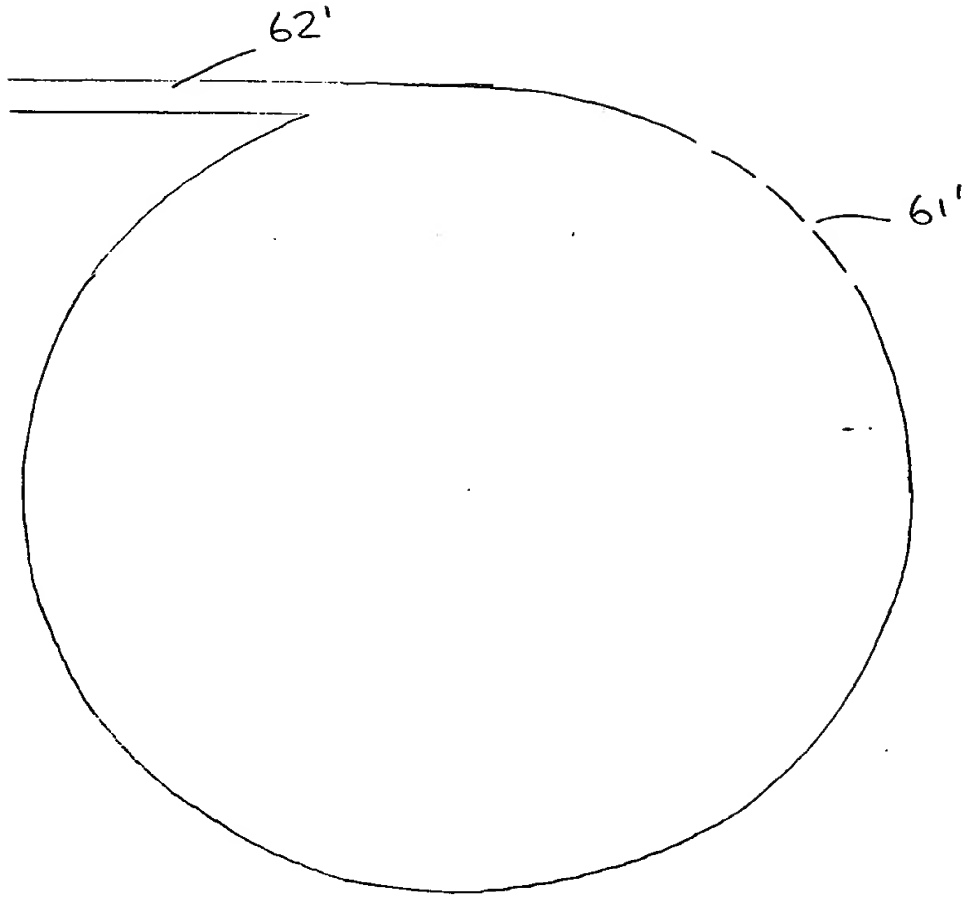

Figure 8

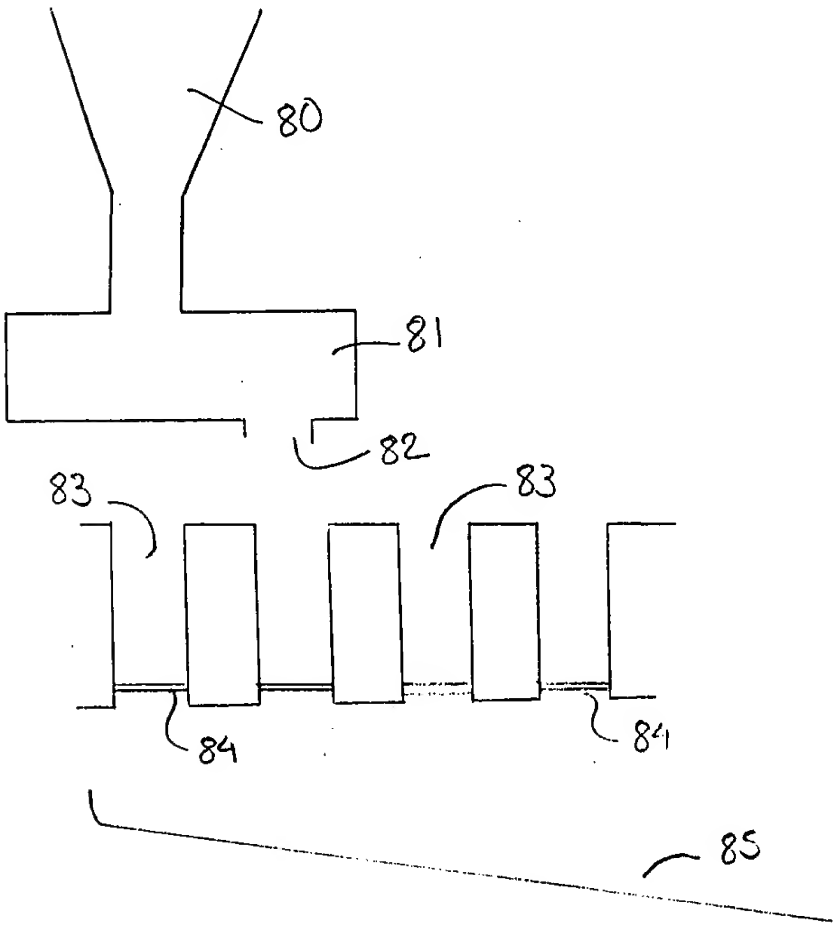

Figure 9

PCT/GB 00/00452

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